

Desired Results

Standard

MAFS.7.NS.1.3: Solve real-world and mathematical problems involving the four operations with rational numbers.

Cognitive Complexity: Level 2, Basic Application of Skills and Concepts

[Access Point](#)

MAFS.7.NS.1.AP3a: Solve real-world and mathematical problems involving the four operations with rational numbers from -100 to 100.

Supporting Standard(s)

When students work toward meeting this standard (which is closely connected to 7.NS.1.1 and 7.NS.1.2), they consolidate their skill and understanding of addition, subtraction, multiplication and division of rational numbers.

MAFS.7.NS.1.1: Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

- Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.*
- Understand $p + q$ as the number located a distance $|q|$ from p , in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.
- Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.
- Apply properties of operations as strategies to add and subtract rational numbers.

MAFS.7.NS.1.2: Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

- Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.
- Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.
- Apply properties of operations as strategies to multiply and divide rational numbers.
- Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

Unpacked Standard Concepts
Students will know . . .

(Underlined Nouns/Noun Phrases)

- Real-world problems
- Mathematical problems
- Four operations with rational numbers

Unpacked Standard Skills
Students will be able to . . .

(Circled Verbs/Verb Phrases)

- Solve

Prerequisite Knowledge and Skills Within Standard (Implied)

For more information: <http://www.p21.org>

- Critical thinking and problem-solving skills
- Flexibility and adaptability
- Attention and self-regulation
- Creativity and innovation skills

Instructional Implications of the Standard (Instruction Needed to Ensure Student Mastery of the Standard)

- Students must be provided with the opportunity to utilize a variety of tools to solve problems involving the four operations with rational numbers (e.g., visual models to solve the problem).
- Review/reteach students understanding of addition and subtraction, including utilization of a horizontal/vertical number line.
- Review/reteach understanding of multiplication/division (including fractions).
- Explicitly teach and model critical thinking and problem solving skills
- Support students' critical thinking and problem-solving skills
- Support students' focus, attention and self-regulation
- Support creativity and innovation skills

Learning Goal I can solve real-world and mathematical problems involving the four operations with rational numbers.	Essential Questions (In student-friendly language) In real life, when would I need to add, subtract, multiple, and/or divide rational numbers? What is an efficient strategy for solving real-world problems with rational numbers? What tools could I use to solve real-world problems involving the four operations with rational numbers?
IEP Learning Goal I can solve real-world and mathematical problems using addition, subtraction, multiplication, or division with rational numbers, with 85% accuracy on quizzes and test where operations from -100 to 100 are assessed by the end of the school year.	

High Probability Barrier(s) (widespread or common) Wide-spread or common barriers that impact many students' engagement and learning (e.g., integrate strategies that support cognitive processing through academic instruction, DI, provide adequate instructional time)	High Intensity Barrier(s) (a few students deal with intensely) Significant impact on individual student engagement and learning (e.g., small group & individual instruction, Differentiated Instruction (DI), aligned with learning needs)
Instruction:	Instruction:
Curriculum:	Curriculum:
Environment:	Environment:
Learner:	Learner:

Instructional Design Depending upon the anticipated barriers above, what implications would these have on the design of your lesson(s) regarding this standard.		
Tier 1	Tier 2	Tier 3
Specially Designed Instruction (SDI)		

Assessment Evidence

Performance Tasks:

- Add, subtract, multiply, and divide positive and negative fractions
- Evaluate a numerical expression
- Rewrite complex fractions as simple fractions in lowest terms
- Solve a real-world problem that involves finding the average of positive and negative decimal numbers
- Solve a real-world problem involving divisions of fractions

Note: Students should not be limited to fractions but receive practice with rational numbers in various forms within the same problem to address the standard

Other evidence:

Scale	
4	In addition to score 3.0, I can explain my thinking.
3	In addition to score 2.0, I can: <ul style="list-style-type: none"> ▪ Add, subtract, multiply and divide rational numbers ▪ Create and solve real world problems with rational numbers ▪ Create and solve mathematical problems with rational numbers
2	I can: <ul style="list-style-type: none"> ▪ Understand the concepts, symbols, and vocabulary for positive and negative number
1	With help, I can have partial success with 2.0 content

Test Item Specs

(http://fsassessments.org/wp-content/uploads/2015/08/Grade7-FSA-ItemSpecs-508_Final_052217.pdf)

Content Standard	MAFS.7.NS The Number System MAFS.7.NS.1 Apply and extend previous understanding of operations with fractions. <ul style="list-style-type: none">• MAFS.7.NS.1.3 Solve real-world and mathematical problems involving the four operations with rational numbers.									
Assessment Limits	Numbers in items must be rational numbers. Complex fractions may be used, but should contain fractions with single-digit numerators and denominators.									
Calculator	Neutral									
Item Types	Equation Editor Multiple Choice Multiselect Table Item									
Context	Allowable									
Sample Item		Item Type								
At 8:00, the temperature was 6 degrees Celsius ($^{\circ}\text{C}$). Three hours later, the temperature was -13°C . By how many degrees Celsius did the temperature change?		Equation Editor								
The change in the price of a certain brand of cereal from 2010 to 2012 is shown in the table. <table border="1"><thead><tr><th>Year</th><th>Change (in dollars)</th></tr></thead><tbody><tr><td>2010</td><td>+0.30</td></tr><tr><td>2011</td><td>+0.20</td></tr><tr><td>2012</td><td>-0.20</td></tr></tbody></table> In 2009 the price of cereal was \$3.69. What was the price of the cereal at the end of 2012?		Year	Change (in dollars)	2010	+0.30	2011	+0.20	2012	-0.20	Equation Editor
Year	Change (in dollars)									
2010	+0.30									
2011	+0.20									
2012	-0.20									
See Appendix for the practice test item aligned to this standard.										

Learning Experiences http://accesstofls.weebly.com/math-resources.html	
Concrete Understandings	Representations
<ul style="list-style-type: none"> • Provide a template for student to determine the sign of the final answer • Model setting up an equation and using a calculator to solve a problem • Use manipulatives to model multiplication and division with integers • Create an array of objects into groups to model the role of equal groups in a multiplication situation. (Make equal groups of objects and recognize different groups can be the same quantity.) • Given a set number of manipulatives, distribute them evenly to create a deficit (e.g., given 10 markers distribute 1 each to 15 students). • Create an array of objects for the mathematical equation and match the answer symbol (+ or -) following multiplication rules for an equation. • Engage with LearnZillion video and manipulatives to model multiplication and division with integers. <ul style="list-style-type: none"> ○ LearnZillion video: multiply a positive integer by a negative integer by thinking about equal groups Click for link ○ Multiply a negative integer by a positive integer by thinking about equal groups Click for link • For teacher background knowledge Click for link • Khan Academy video: interpreting multiplication and division of negative numbers Click for link • Khan Academy video: multiplying and dividing negative numbers word problems Click for link 	<ul style="list-style-type: none"> • Use tools, as needed, to complete the four operations with integers. • Create a pictorial array for the mathematical equation and match the answer symbol (+ or -) following multiplication rules for an equation. • Create a pictorial array for the mathematical equation and match the answer symbol (+ or -) following division rules for an equation. • Given a scenario, students can use operations to solve problems. (e.g., 10 students can fit on a school bus, 35 students have signed up for a field trip. How many buses do they need?) • Understand the concepts, symbols, and vocabulary for: positive number, negative number.
Additional CPALMS Resources: www.cpalms.org <ul style="list-style-type: none"> • 19 STEM Lessons – Model Eliciting Activity (MEAs) • 5 MFAS Formative Assessments • 26 Lesson Plans • 6 Tutorials • 3 Problem-Solving Tasks • 2 Assessments • 1 Teaching Idea • 1 Unit/Lesson Sequence • 6 Student Resources • 1 Parent Resource 	Supports and Scaffolds: <ul style="list-style-type: none"> • Calculator • Manipulatives • Arrays • Multiplication Tables • Interactive Whiteboard • Online Calculator • Visual Models and Virtual Manipulatives